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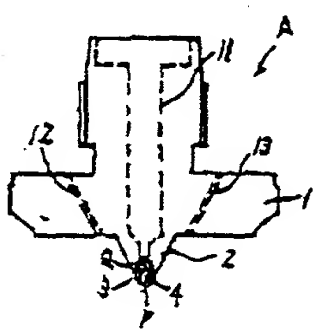
(54) SPIRAL APPLICATION METHOD OF ADHESIVE

(57) Abstract

PROBLEM TO BE SOLVED: To perform uniform dense application by making a rotating pressurized air current by a pressurized air current rotate/flow down along a conical projection, making the rotating pressurized air current locally contact a molten adhesive flowing down in the through hole of a deformed cylinder on the adhesive exposing surface of the projection, and making a preliminary draw action be done.

SOLUTION: In adhesive spray application, a pressurized air current from apressaurized air holes 13, since the holes 13 are eccentric, is made a rotating current and rotates/flows down along a conical projection 2. A string-shaped molten adhesive beat discharged from the adhesive hole 12 of a nozzle A is brought into an action to form spiral adhesive fibers. In this process, the pressurized air current is brought into contact with a molten adhesive flowing down on the adhesive exposing surface P of the projection 2, by the preliminary drawing of the molten adhesive, main drawing thereafter is done more strongly, and the adhesive fibers are rotated at a high speed. In this way, dense application is made possible even when a substrate is moved at a high speed.



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1. This invention is about spiral application method of adhesive.
2. Conventional technology and its problem.
   In adhesive spray application, Adhesive can apply spirally by discharge from the center of rotating airflow. This kind of application is described in No, S63-283774 (fig. 23-24). And it is generally used for processing of the diaper but it has some problems below.
   (1) When a substrate is moved at low speed, the side of pattern has more adhesive than the center of pattern (fig. 25).
   (2) When a substrate is moved at high speed, density of the pattern become to thin. Because the rotate speed of adhesive is not enough to make dense pattern (fig. 22).
3. This invention is to make uniform and dense application, and solve the above problems.
4. Method for solve the problems
   (1) First invention; Make the adhesive-exposing surface **P** on the top of the conical projection **2** (fig. 5).
   (This part is almost same to **SOLUTION** of the text.)

   (2) Second invention; Make the pressurized air-exposing surface **Q** on the top of the conical projection **2** (fig. 5).
   Pressurized air current that rotate and flow/down along the conical projection **2** contacts air-exposing surface **Q**, and is deflected. Therefore, the adhesive fibers rotate at high speed and make the oval pattern.
5. Examples
   (1) Example 1(Fig. 1~5); Made **P** and **Q** by processing the tip of conical injection.
   (2) Example 2(Fig. 6~10); Made **P** and **Q** by insertion tube.
   (3) Example 3(Fig. 11) ; Made **P** and **Q** by processing the tip of conical injection.
   (4) Example 4(Fig.12); Surface **Q** is parallel to the axis of insertion tube **3b**.
   (5) Example 5(Fig. 14); Make only surface **Q**.
   (6) Example 6(Fig. 13); Make only surface **P**.

*It is better that the angle of tip of nozzle γ is smaller. But, if angle γ is less than 30°, it will weaken the strength of nozzle. Therefore, the angle γ is better about 45°.

*The diameter of adhesive orifice is better to small. However, it depends on the viscosity of adhesive, amount of adhesive (g/min), and endurance for pressure of the application etc. Generally, it is better from **0.4mm** to **0.6mm**.

6. Principles of these inventions

(1) The co-under effect ; The fluid that flows at high-speed flows along beside the wall. In this invention. The pressurized air rotates and flows down along the conical injection. Next, The portion of the air flows along the bevel in the shape of "V"(Pressurized air exposing-surface Q). The airflow that contacts the surface Q is deflected, therefore, pressurized air flows down ovally. For stabilization of this effect, It is better that the length of the bevel makes longer.

(2) Normally, injection speed of adhesive is a few centimeter/minute. Whereas the pressurized air flows at 200~300 meter/second. Cause of this influence, adhesive is accelerated to a few 10 meter/second finally. In this circumstance, adhesive is not drawn enough by drawing resistance. In this invention, the nozzle has approach area(between the point that adhesive starts to contact the air and the point that adhesive tear from the nozzle.). The preliminary drawing of adhesive is done at this area, therefore the main drawing is done strongly and adhesive can be rotated at high speed.

(3) The closer to the motionless wall the viscous fluid moves , the slower it flows. When the adhesive is drawn by pressurized air, the adhesive still contacts with inner surface of orifice. Therefore, adhesive can be divided two flows by relationship between the viscosity of adhesive and flow-rate of pressurized air (Fig. 16). When a substitute moves at high-speed, adjust the flow-rate of pressurized air to make two adhesive flows.

7. The sample of the pattern.

(1) Test 1(fig 17) ; Nozzle type - Example 2(Fig. 6~10)
; Diameter of air hole – 0.5mm
; The number of air hole – 12
; Pitch diameter of air hole – 4.5mm
; Angle of air hole(α) - 30°
; Rotational angle of air hole(β) - 22°
; Diameter of the base of cone – 2.7mm
; Height of cone – 2.0mm
; Angle of cone – 50.8°
; Inner diameter of adhesive hole(12) – 0.5mm
; Diameter of insertion tube(3a) – 0.8mm
; Angle of insertion tube (γ) - 45°
; Length of exposed part of insertion tube – 1.0mm
; Hot melt(Viscosity ; 4 Pa-s at 160°C , 20 g/min)
; Hot air(180°C, 0.8 N-m/Hr)
; Distance from substrate - 30mm
; Line speed – 500m/min
; Width of pattern – 23mm

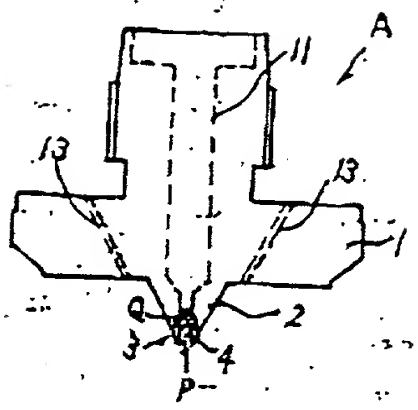
(2) Test 2(Fig 18) ; Line speed – 500m/min
; Other condition is same to Test 1.

(3) Test 3(Fig 19) ; Line speed – 300m/min
; Other condition is same to Test 1.
(4) Test 4(Fig 20) ; Hot air(180°C, 0.8 N-m/Hr)
; Distance from substrate - 25mm
; Other condition is same to Test 3.

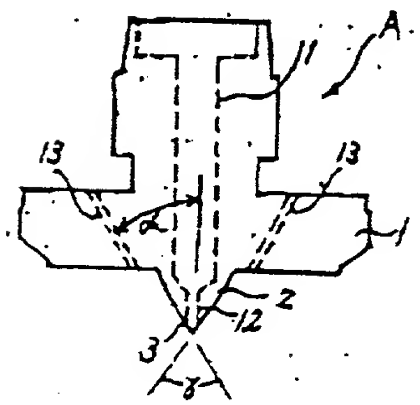
8. Compare with conventional nozzle.
(1) Comparison 1(Fig 21) ; Nozzle type – Conventional (Fig23~25)
; Height of cone – 2.0mm
; Inner diameter of adhesive hole – 0.5mm
; Distance from substrate - 18mm
; Width of pattern – 22mm
; Other condition is same to Test 1.
(2) Comparison 1(Fig 22) ; Line speed – 150m/min
; Other condition is same to Comparison 1.

Description of symbol
A ; Nozzle
P ; Adhesive exposing-surface
Q ; Pressurized air exposing-surface
α ; Angle of air hole
β ; Rotational angle of air hole
γ ; Angle of tip of nozzle
1 ; Nozzle base
2 ; Conical projection
3 ; tube
3a ; Insertion tube
3b ; tube
4 ; Void in the shape of "U"(Adhesive exposing-surface)
5 ; Bevel
11 ; Supply of adhesive
12 ; Orifice of adhesive
13 ; Air hole

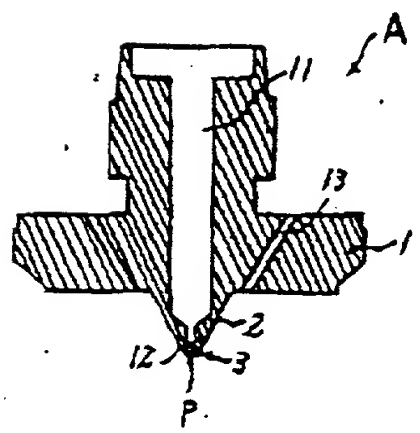
【図1】


A
11
13
13
1
2
3
4
P

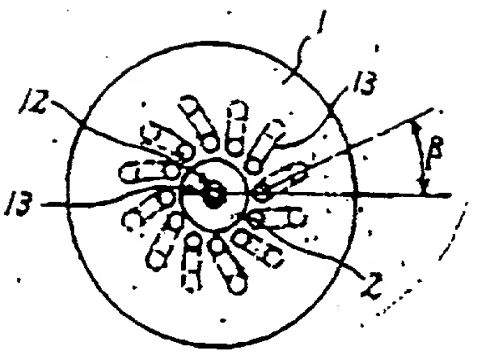
【図2】


A
11
13
13
1
2
12
3
α

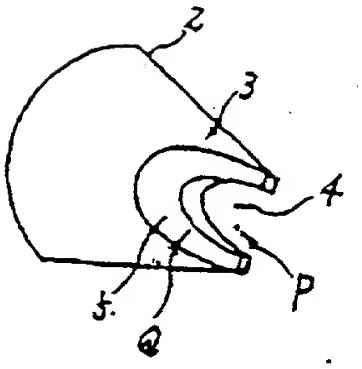
【図3】


A
11
13
1
2
12
3
P

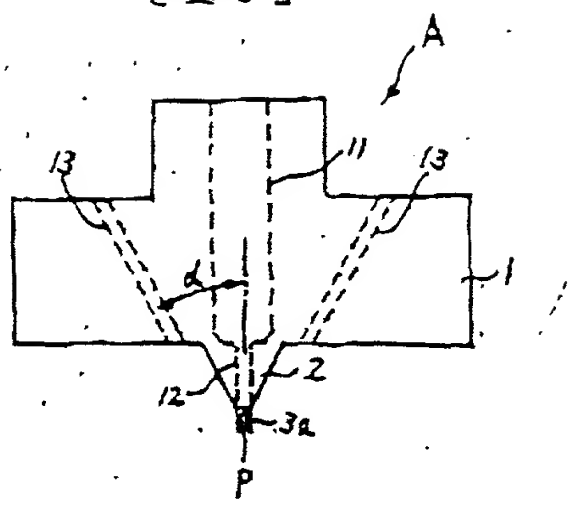
【図4】


1
12
13
β
13
2

【図5】


2
3
4
P
5
Q

【図6】



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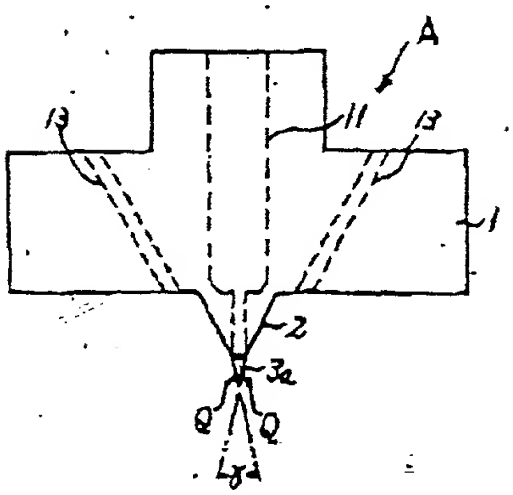

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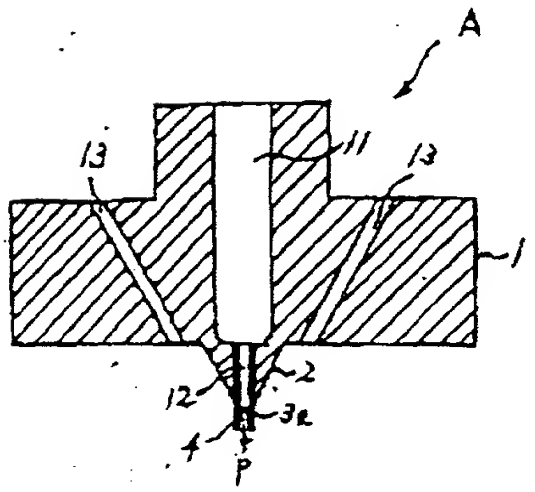

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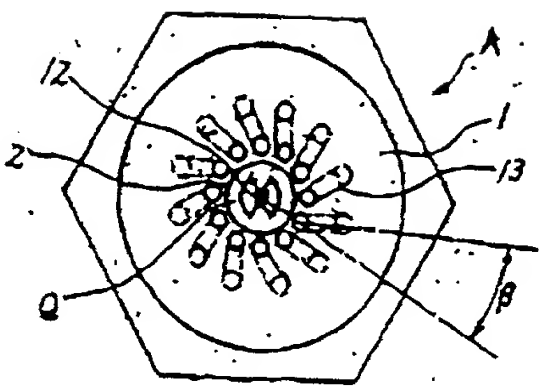

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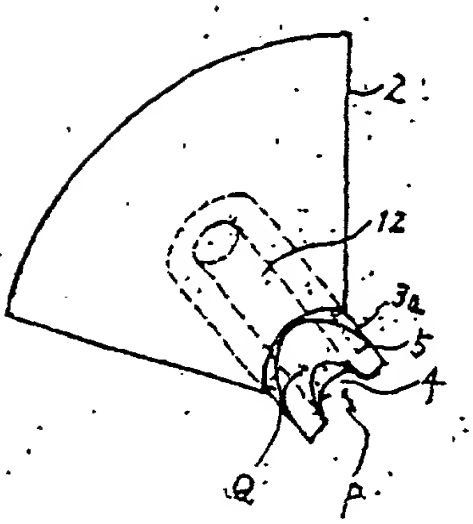

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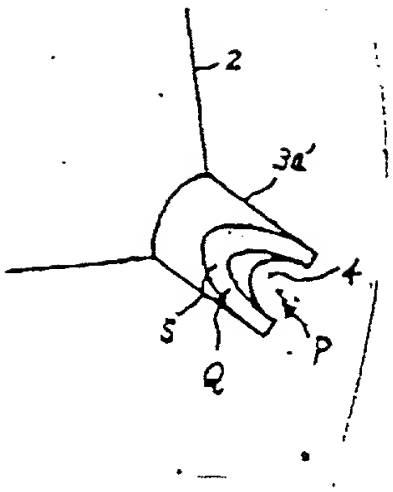

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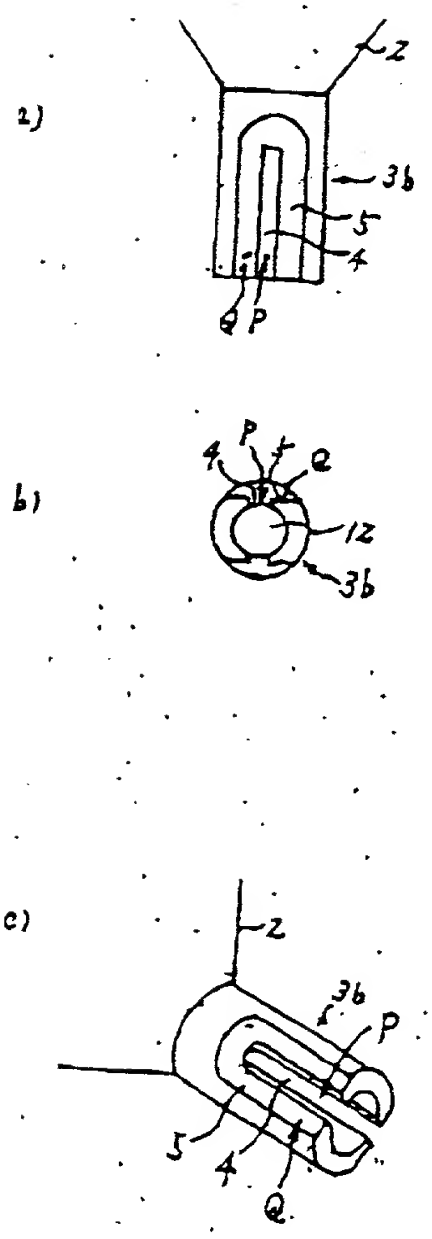

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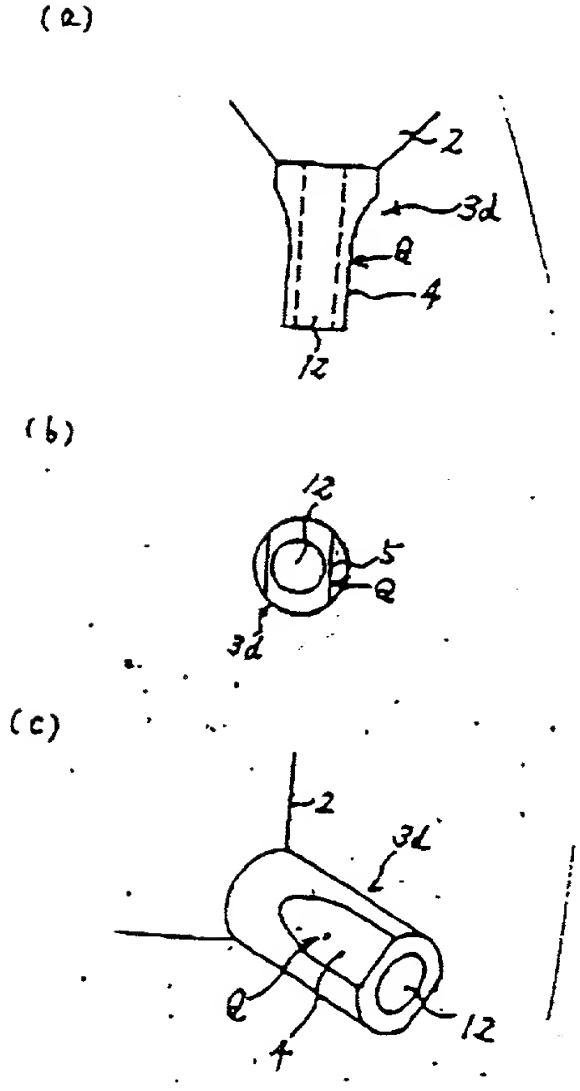

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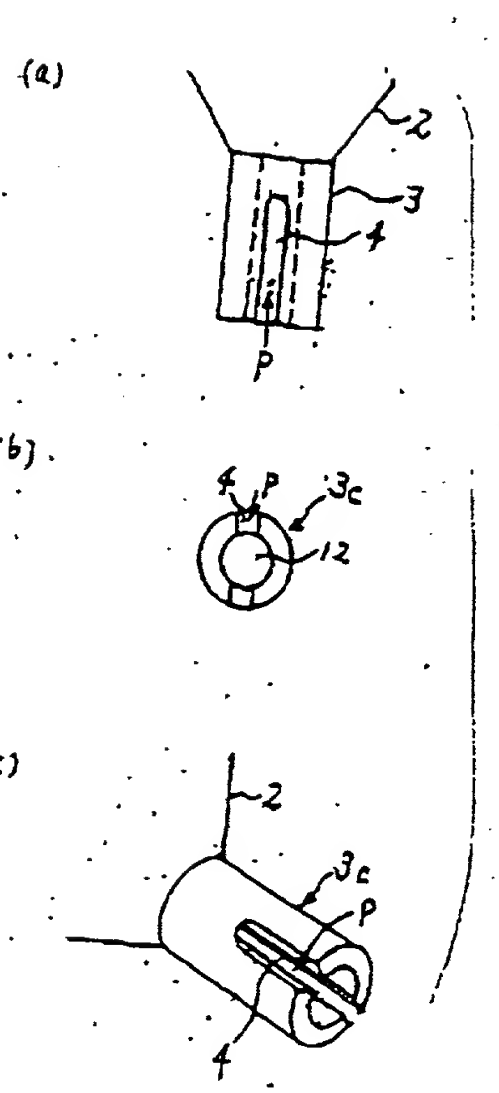

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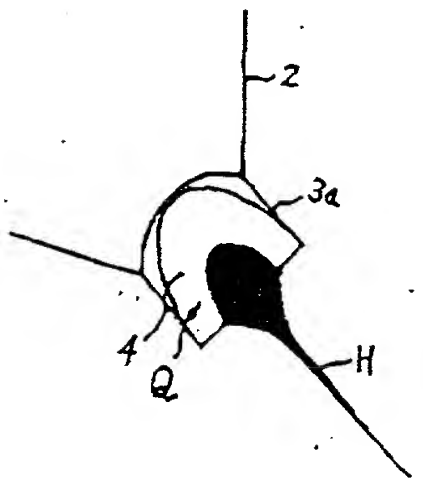

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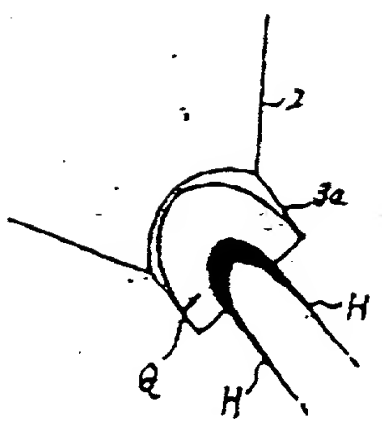

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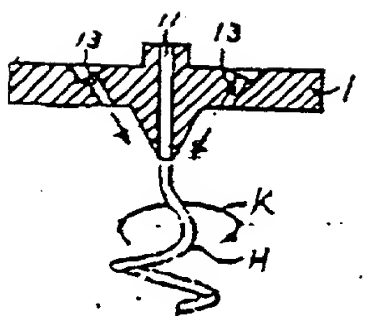

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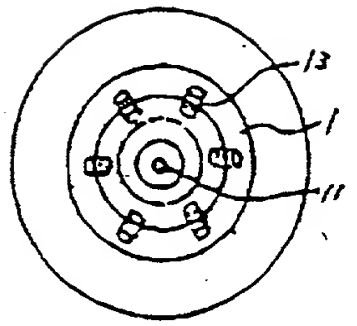

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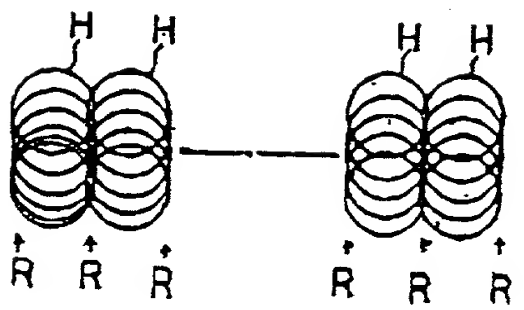
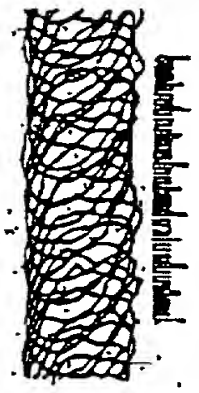


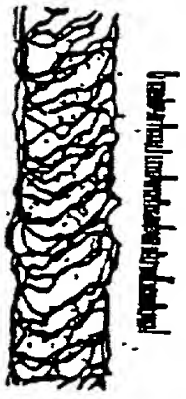
【図１７】

【図１８】



【図１９】

【図２０】



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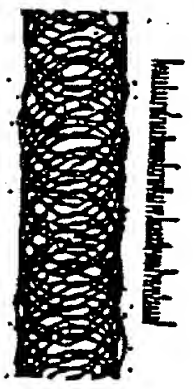

【図２２】